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PATENT SPECIFICATION

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Under International or Intercolonial Arrangements.
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Drawings (2 sheets) attached.

COMPLETE SPECIFICATION

"Improvements in pipe couplings and the like."

I, Lewis Mervyn Cecil Seamark, of Pyne Cliff, Lyme Regis, in the County of Dorset, England, of British Nationality, hereby declare this invention and the manner in which it is to be performed, to be fully described and ascertained in and by the following statement:

The invention relates to pipe couplings in which an annular coupling or clamping member or members is or are adapted to apply pressure upon interposed packing, and at the same time to hold the respective pipe lengths, whereby a tight joint or joints is or are ensured, and the pipe lengths firmly held under the pressure imposed by bolts or other means that may be employed to maintain the coupling in the closed position.

The invention has also among its objects to avoid separation of the pipe lengths on expansion or contraction of the pipe fitting under varying conditions of temperature, to ensure ready assembly or separation of the parts as may be required, without any necessary special preparation of the pipe lengths being required.

According to the invention contractible metal rings are adapted on the coupling or clamping members being caused to approach each other, to be subjected to pressure for gripping the ends of the respective pipe lengths to be coupled, and to apply pressure for the compression of packing interposed upon or between the pipe lengths, the coupling or clamping members being secured together by bolts or other equivalent means adapted for the application of pressure upon the respective ends of the pipe lengths to grip the ends thereof, and to form pressure-tight packed joints upon the interposed rings of packing.

According to the invention moreover in order that the metal rings are contractible they are provided of a corrugated form, with transversely disposed radial slots in alternating series, the alternate tranversely disposed slots being respectively closed and open at opposite sides. Thus alternate slots of one series are closed at one lateral face of the ring and are open at the opposite lateral face, while the slots of the

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second series are open at the lateral face at which the adjacent slots are closed and closed at the lateral face at which the adjacent slots are open, so that thus the external and internal peripheries of the metal rings have a zig-zag shape by reason of adjacent slots being open at opposite sides of the ring, whereby an elastic characteristic is imparted to the ring.

By such preparation of the metal rings they are adapted to be reduced in diameter under the radial pressure imposed, such as is applied by the clamping rings on the closing up of the respective radial slots. The elasticity thus imparted to the metal rings by the slots is such that the clamping rings cause the metal rings effectively to compress the packing before the metal rings are themselves compressed around the pipe sections or other elements to be coupled.

The lateral face of each metal ring may be adapted to be applied to the packing and may be undercut or inclined in direction to increase the pressure exerted upon the packing. Similarly, the form of the metal rings may be such in relation to a triangular or other advantageous cross-sectional shape of the adjacent packing ring that an effective joint with the ends of the pipe lengths or other elements is made, without the necessary use of an intermediate abutment sleeve.

The invention comprises the respective modifications in construction as hereinafter described.

The invention is illustrated in the accompanying drawings in which:—

Figure 1 shows in partial longitudinal section a pipe coupling of bolted type.

Figure 2 shows in partial longitudinal section a pipe coupling of union type.

Figure 3 shows in partial longitudinal section a pipe coupling adapted for the connection of copper tubing to the end of a threaded pipe fitting.

Figures 4 and 5 show in end elevation and partial longitudinal cross-section a pipe coupling adapted to maintain a tight joint between the ends of the pipe lengths connected and firmly to grip the pipe lengths.

Figures 6 and 7 shows the contractible metal ring in diagramatic cross-section and elevation respectively, and Figure 7a shows the ring in fragmentary plan in the direction indicated by the arrow B.

Figures 8 to 13 illustrates a modified form of contractible metal ring.

Figure 8 is a sectional elevation of the contractible metal ring.

Figure 9 is a part elevation of the ring in the direction of the arrow A (Figure 8).

Figure 10 is a part elevation in the direction of the arrow B (Figure 8).

Figure 11 is a part elevation of the packing ring adapted for application to the contractible metal ring (Figure 8).

Figure 12 is a sectional elevation of the packing ring illustrated in Figure 11.

Figure 13 is a part sectional elevation showing the packing ring mounted upon the contractible metal ring.

In carrying the invention into effect by way of example as illustrated in Figure 1 of the accompanying drawings, the respective contractible rings a are advantageously of steel and have parallel lateral faces a^1, a^1, and an internal cylindrical surface that is a sliding fit upon the ends of the respective pipe lengths c, c to be connected, on which they are applied. The internal circumferential surface of the contractible metal rings a has a sliding fit upon the ends of the respective pipe lengths to be connected, and may advantageously be serrated or roughened for gripping the outer peripheral surfaces of the pipe lengths to be coupled.

The outer peripheral surfaces of the contractible metal rings a are respectively coned, whereby the deeper ends of the rings are oppositely disposed.

Each lateral face of the contractible metal rings a illustrated in detail in Figures 6 and 7 is radially slotted at equally spaced intervals circumferentially from the opposite lateral faces, and the slots a^2, a^3 (Figure 7a) thus provided are carried through the thickness of the metal ring alternately from the opposite lateral faces for a distance of about three-quarters of the width of the metal ring a so that thus alternate slots a^2, a^3 are open at one lateral face and are closed at the other opposite lateral face, whereby the slots are advantageously provided in number such that the thickness of the metal between the slots open at the respective opposite lateral

faces is approximately equal to one quarter of the thickness or width of the metal ring so that the thickness of the metal extending zig-zag throughout the ring is approximately uniform.

The coupling or clamping members b at their inner ends are, as illustrated for example in Figures 1 to 3, of a width greater than that of the corresponding contractible metal rings a and are provided with an internal conical face to correspond in position with the conical outer face of the corresponding metal rings a.

The outer part of the respective clamping members b are bored parallel with the axis to form a number of spaced holes for the bolts b^1, or alternatively the clamping members b may be formed with two or more lugs that are provided with bolt holes.

An intermediate abutment sleeve e of common form is conveniently disposed between the contractible rings a (Figure 1) of the two coupling or clamping members b with packing rings d of rubber or other packing material advantageously of triangular or circular cross-section interposed. The abutment sleeve e has its end contact faces oppositely inclined or coned inwardly from the external peripheral face to the internal peripheral face and conveniently has its internal face of a concave form or reversely coned so that the pipe lengths c, c to be coupled need not necessarily be in true alignment. Midway in the length of the abutment sleeve e there may be provided an integral inwardly directed flange e^2 that may be positioned between the ends of the pipe lengths c, and thus determine the disposition of the sleeve e with reference to the adjacent pipe lengths to be connected.

In the use of the coupling illustrated in Figure 1, the clamping members b and contractible metal rings a are first passed over the ends of the corresponding pipe lengths c, c. A packing ring d is also passed over each pipe length between the contractible metal ring a and the abutment sleeve e. The abutment sleeve e is then positioned upon the end of one of the pipe lengths, and the other pipe length is moved into position so that its end may enter the abutment sleeve e and abut against the flange e^2. The contractible metal rings a are then brought up into proximity with the respective ends of the abutment sleeve e so as to confine the packing rings d, and the clamping members b are then mounted upon the metal rings a and connected by the clamping bolts b^1. On the tightening of the bolts b^1 the clamping members b are drawn together and as they approach they carry the respective metal rings a with them so that pressure is thus applied to the packing rings d to bring them into close contact with the inclined end faces of the abutment sleeve e. As the clamping members b continue to move inward as the bolts b^1 are tightened, the clamping members b, b ride over the respective metal rings a and compress them to close the numerous transverse slots within the metal rings a and reduce the diameter of the metal rings a until the rings firmly grip the external surface of the pipe lengths c, c near the ends.

It will be understood that the abutment sleeve e may be omitted if the packing d is provided of a suitable form such as a packing ring of triangular cross-section, that may be compressed between the correspondingly inclined lateral faces of the metal rings a.

In carrying the invention into effect as illustrated in Figure 2, the coupling or clamping members b, b are substantially the same as illustrated in Figure 1, except that the coupling or clamping members b, b are provided as externally screw-threaded sleeves respectively having right hand and left hand threads, for the engagement of a centrally disposed surrounding sleeve b^3 having internally screw-threaded ends respectively having right and left hand threads corresponding with the external right and left hand threads of the externally screw-threaded sleeves b, b.

The externally screw-threaded sleeves b, b (Figure 2) have at their respective outer ends an integral flange b^7 of such width that the external periphery of the flanges b^7 may be formed with external hexagonal faces whereby the externally screw-threaded sleeves b, b may be conveniently engaged by a tool for their adjustment into the postions necessary to apply pressure upon the interposed packing rings d of triangular or other cross-section and to compress and

deform the respective metal rings a, provision being made by an internal central cavity b^5 in which the inner ends of the externally screw-threaded sleeves b^2 are accomodated, as they move inward to apply such pressure as to deform the metal rings a and to ensure a pressure-tight joint.

In carrying the invention into effect as illustrated in Figure 3, the contractible metal ring a is employed for the connection of tubing k for example of light copper directly to the end of a pipe fitting h. For this purpose the enlarged end h^1 of a length of the pipe fitting h is screw-threaded externally for the reception of the internally screw-threaded end of a clamping sleeve i one end of which is of a forwardly tapering conical form, the conical face of the cone at the front end conforming to the angle to the outer face of the metal ring a such as hereinbefore described with reference to Figures 6 and 7 of the accompanying drawings; the metal ring a (Figure 3) being serrated or roughened at its internal surface for the purpose effectively to grip the end of the copper tubing k, and a packing ring j is interposed between the inclined end face of the enlarged end of the pipe fitting h and the end of the metal ring a; and the packing ring j is supported at the end of the copper tubing k. The rear part of the clamping sleeve i is advantageously provided externally hexagonal whereby the sleeve i may be conveniently engaged. By such means the clamping sleeve i is adapted conveniently to be rotated for applying pressure to the packing ring j and for compressing the metal ring a and gripping the end of the tubing k.

In carrying the invention into effect as illustrated in the construction in Figures 4 and 5, the coupling or clamping members b, b are connected together at spaced intervals by bolts b^1 as in the construction illustrated in Figure 1. The coupling or clamping members b, b are respectively provided with integral quarter segments b^4, b^5, b^4, b^5, the alternate segments being integrally formed in oppositely disposed pairs with the respective coupling or clamping members b, b.

The undersurfaces of the respective coupling or clamping members b incline outward at each side at b^8 to contact respectively the top face of the contractible metal rings beneath, the outer faces of which incline inward near their outer ends, whereby on the coupling or clamping members b, b being drawn together on the rotation of the nuts b^{11}, the contractible metal rings a approach each other and contact the packing rings f of arrow head cross-section at the outer ends of the tubes c, c to be connected, whereby the respective coned internal faces k^1 come into contact with the inclined external faces of the packing rings f, and the ends of the pipe lengths c, c are gripped, the ends of the pipe lengths approaching each other whereby the packing ring f is compressed as in the inclined inner faces k^1 move inward, whereby a tight joint is made and the ends of the pipe lengths c firmly gripped in postion.

In Figure 5 the metal rings are in their partially closed position, and in the completion of their inward movement their front faces k^1 tightly contact the outer inclined faces of the packing f and make a pressure-tight joint. Further inward movement of the part b compresses the contractible rings a and effects a grip on the pipe ends c.

As illustrated in Figures 8 to 13, the metal ring a is provided at a^2 with an external conical periphery integral with the part a^2 having a cylindrical periphery, and an inwardly inclined front face a^3. The metal ring a (Figure 8) is provided with a series of slots a^6 open at the outer face a^1 of the ring cross-sections the slots a^6 extending short of the opposite inclined face a^3, while a series of facial slots a^7 extend from the inner side short of the outer side a^1 on the ring. The internal peripheral face of the ring a^8 is roughened or serrated for effectively gripping the circumferential face of the pipe lengths. A packing ring d^1 advantageously formed of rubber-or-incorporating rubber and of a substantially triangular cross-section is mounted upon the ring a by means of outwardly extending projecting parts d^2 that have such a thickness as to be inserted into the corresponding series of radial slots a^7 in the position indicated in Figure 13. By such means the packing ring d^1 is formed as a unit with the contractible metal ring a and is adapted to be

inserted within an annular cavity beneath the coupling or clamping members b of the pipe coupling with the packing ring d^1 innermost.

Having now fully described and ascertained my said invention and the manner in which it is to be performed, I declare that what I claim is:—

1. A contractible metal ring adapted for use in pipe couplings for application near the adjacent ends of the pipe lengths to be coupled, the ring having an internal cylindrical face and an external conical face, and a circular series of transversely disposed and narrow radial slots extending across the ring from one end face of the ring cross-section to a postion short of the opposite end face, each of the narrow slots being thus open at one end face and closed at the other, while adjacent slots are open and closed at the respective end faces of the ring cross-section, an elastic characteristic being thus imparted to the ring whereby the ring is adapted to be contracted under the pressure applied to the ring by the clamping operation of the surrounding clamping member of the coupling transmitted through the ring.

2. A contractible metal ring adapted for use in pipe couplings for application upon the respective adapacent ends of the pipe lengths to be coupled, the respective rings having an internal cylindrical face and an external conical face and a circular series of transversely disposed and narrow radial slots extending across the rings from one end face of the ring cross-section to a postion short of the opposite end face, the slots of the circular series being open at one end face of the ring cross-sections and closed at the opposite end face, while adjacent slots of the series are respectively open and closed at the opposite end faces of the ring cross-section whereby at each end face of the ring cross-sections the slots are alternately open and closed, an elastic characteristic being thus imparted to the rings whereby they are adapted to be contracted under the pressure applied to the rings by the clamping operation of the surrounding coupling and clamping members of the pipe coupling, transmitted through the rings.

3. A pipe coupling consisting in combination of the two pipe lengths to be coupled, a pair of contractible metal rings applied upon the oppositely disposed ends of the pipe lengths, the said rings having each an internal cylindrical face of a diameter corresponding to that of the pipe lengths and an external conical face, a circular series of transversely disposed narrow radial slots extending across the respective rings from one end face of the ring cross-sections to a position short of the opposite end face, each of the narrow slots being thus open at one end face and closed at the other, while adjacent slots in the rings are respectively open and closed at the respective end faces of the ring cross-sections, a pair of clamping members each having a central hole therein and a conical face forming with the respective ends of the pipe lengths, annular spaces of a cross-section corresponding to that of the contractible metal rings, within which the respective metal rings are mounted.

4. A pipe coupling as specified in claim 3, in which an abutment sleeve is disposed in position midway between the coupling and clamping members, having upwardly and outwardly inclined end faces, the respective ends of the sleeve extending into and claiming members and the cylindrical faces of the respective pipe lengths, and contacting a packing ring having a correspondingly inclined face to that of the respective ends of the abutment sleeves, and set in position inward of the respective contractible metal rings.

5. A pipe coupling as specified in claim 3, in which an abutment sleeve is provided in a midway position in its length with an integral inwardly directed flange, adapted to enter into position between the oppositely disposed ends of the pipe lengths to determine the position of the pipe lengths.

6. A pipe coupling consisting of a pair of coupling and clamping members each members having an equal number of segments extending inward from the respective coupling and clamping members whereby the respective segments of one coupling and clamping member are interposed between segments of the other to form a cylindrical enclosure, a number of parallel bolts spaced apart at equal distances to connect the said pair of coupling and clamping mem-

bers, the said connected coupling and clamping members having an internal central cylindrical surface and lateral inclined or conical faces extending therefrom to the respective end faces of the coupling and clamping members, and two contractible metal rings as specified in claim 2 adapted to be applied respectively at the tending within the pair of coupling and clamping members.

7. A pipe coupling as specified in claim 6, in which the contractible metal rings are of a five-sided form in transverse cross-section and otherwise as specified in claim 2.

8. A pipe coupling consisting of the two pipe lengths to be coupled, a pair of coupling and clamping members having circular apertures in alignment, of internally conical cross-sectional form, the cross-section of the apertures being reduced toward the respective outer faces of the coupling and clamping members, contractible metal rings as specified in claim 2 within the respective apertures formed between the said coupling and clamping members and the external circumferential faces of the pipe lengths corresponding in form to the cross-sectional shape of the respective contractible metal rings, having their outer faces conical and their inner faces conforming to the cylindrical peripheries of the respective pipe lengths, and means for drawing together the pair of coupling and clamping members to impose pressure upon the contractible metal and packing rings.

9. A pipe coupling as specified in claim 4 in which an abutment sleeve is disposed between the pair of coupling and clamping members, the abutment sleeve having inclined end faces for the application of lateral pressure upon the packing and the contractible metal rings.

10. A pipe coupling consisting of two pipe lengths the first of which has a conical end face, the second pipe length being of tubular form, the inner part of which is adapted to contact the lower part of the annular conical end face of the first pipe length, a packing ring mounted in position against the upper part of the annular conical end face of the first pipe length and upon the end of the second pipe length, a contractible metal ring having an internal cylindrical face applied upon the second pipe length, the metal ring having a circular series of transversely disposed and narrow radial slots extending across the ring cross-section to a postion short of the opposite end face, each of the narrow slots in the said ring being open at one end face of the cross-section and closed at the other, while adjacent slots are respectively open and closed at the end faces of the cross-section, an elastic characteristic being thus imparted to the contractible metal ring whereby it is adapted to be contracted under pressure applied upon the rotation of an external rotatable clamping sleeve mounted upon the outer end of the first pipe length, the clamping sleeve having an inwardly inclined conical part yielding with the second pipe length an annular space between having an internal conical face conforming to the external conical periphery of the contractible metal ring, whereby the packing and ring are subjected to the pressure of the clamping ring on its rotation, whereby a tightly packed joint is maintained upon the conical end face of the first pipe length and the end of the second pipe length is firmly held connected by the clamping ring applied upon the end of the first pipe length.

11. Pipe couplings substantially as hereinbefore described with reference to the accompanying drawings.

DATED the 5th day of March, 1946.

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Patent Attorney for Applicant.

Witness: V. J. Cleary.

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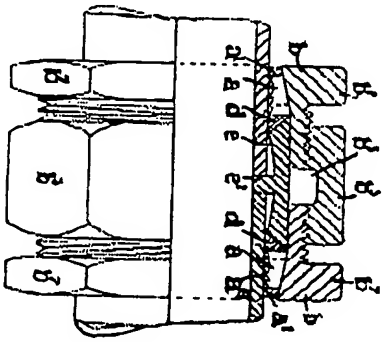

Fig.2

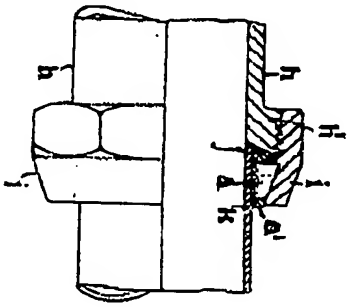

Fig.3

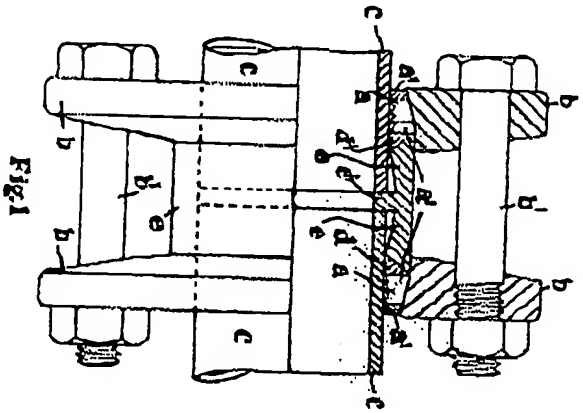

Fig.1

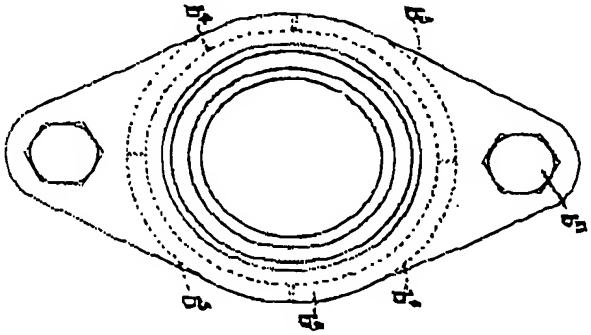

Fig.4

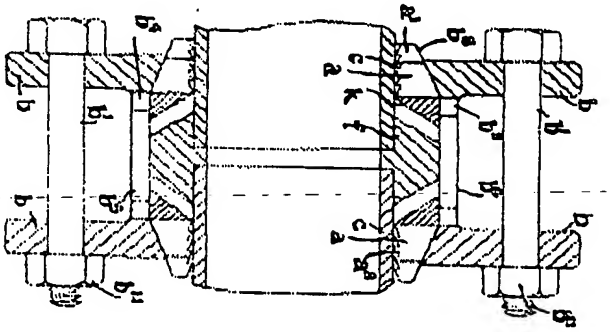

Fig.5

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Fig.7a

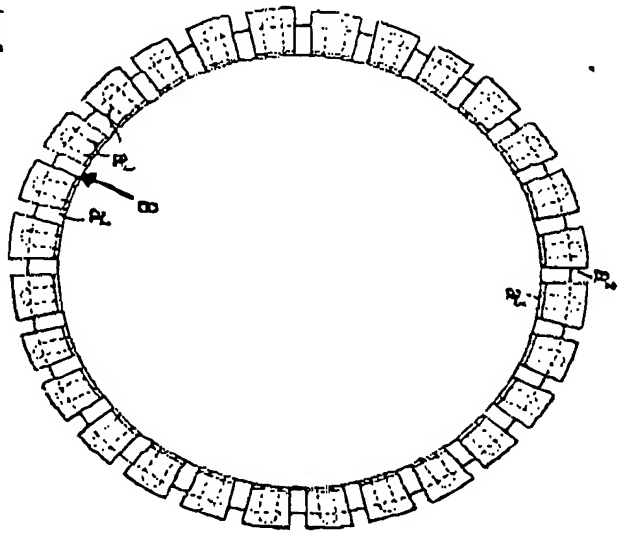

Fig.7

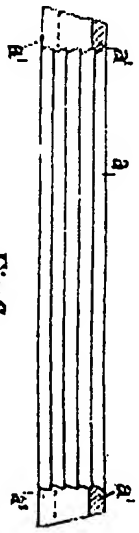

Fig.6

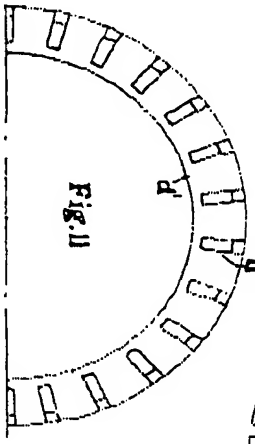

Fig.11

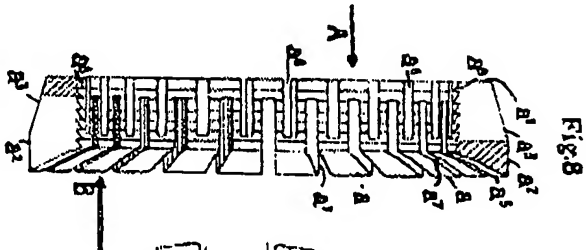

Fig.8

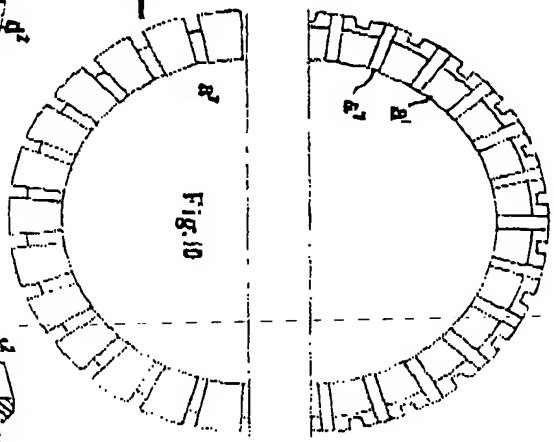

Fig.10

Fig.9

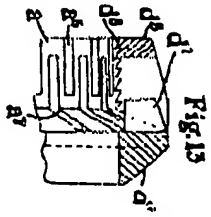

Fig.13

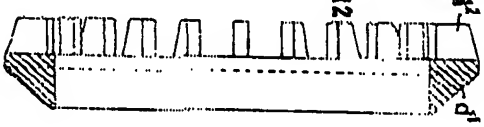

Fig.12

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